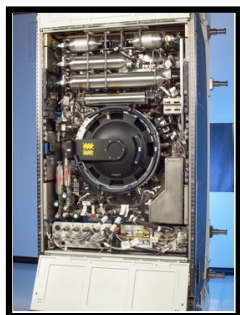




Advanced Combustion via Microgravity Experiments (ACME)



Combustion Integrated Rack (CIR)

Spherical Flame (s-Flame)

PI: Prof. C. K. Law, Princeton University

Co-Is: Prof. Stephen Tse, Rutgers U.; Dr. Kurt Sacksteder, NASA GRC

Flame Design

PI: Prof. Richard Axelbaum, Washington University, St. Louis

Co-Is: Prof. Beei-Huan Chao, U. Hawaii; Prof. Peter Sunderland, U. Maryland; Dr. David Urban, NASA GRC

Coflow Laminar Diffusion Flame (CLD Flame)

PI: Prof. Marshall Long, Yale University

Co-I: Prof. Mitchell Smooke, Yale University

Electric-Field Effects on Laminar Diffusion Flames (E-FIELD Flames)

PI: Prof. Derek Dunn-Rankin, UC Irvine

Co-Is: Prof. Felix Weinberg, Imperial College, London; Dr. Zeng-Guang Yuan, NCSER/GRC

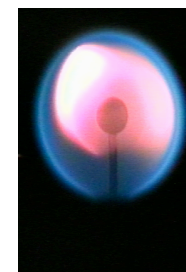
PS's: Dennis Stocker, NASA GRC; Dr. Fumiaki Takahashi, NCSER/GRC

PM: Robert Hawersaat, NASA GRC

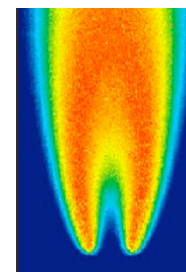
Engineering Team: ZIN Technologies, Inc.



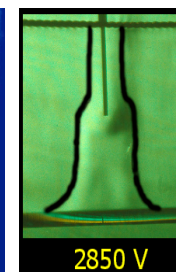
s-Flame
(drop test)



Flame
Design
(drop test)



CLD Flame
(aircraft test)



E-FIELD
Flames
(1g schlieren)

Glenn Research Center

ISS Resource Requirements

| Accommodation (carrier) | CIR |
|--|--------------------|
| Upmass (kg) (w/o packing factor) | TBD kg |
| Volume (m³) (w/o packing factor) | TBD m ³ |
| Power (kw) (peak) | TBD Kw |
| Crew Time (hrs) - Initial configuration of CIR Rack - Change-outs during experiment | TBD hrs TBD hrs |
| Autonomous Ops (hrs) | TBD hrs |
| Launch/Increment | TBD |

Objective:

- ♦ Modular apparatus designed for gaseous fuel investigations to study:
 - combustion structure and stability near flammability limits
 - soot inception, surface growth, and oxidation processes
 - emission reduction through nitrogen exchange
 - combustion stability enhancements via an electric field

Relevance/Impact:

- ♦ Verified computational models that will enable the design of high efficiency, low emission combustors operating at near-limit conditions.
- ♦ Reduced design costs due to improved capabilities to numerically simulate combustion processes.
- ♦ Efficient soot control strategies for industrial applications.

Development Approach:

- ♦ Flight design leverages off previous flight design heritage.
- ♦ Multi-user, re-usable apparatus minimizing up-mass/volume, costs, and crew involvement.

Project Life Cycle Schedule

Revision Date: 2008/12/03

| Milestones | SCR | RDR | CDR | VRR | Safety (PH-3) | PSR-2 | Ship | Launch | Ops | Return | Final Report |
|-------------------------|---|--------|---------|--------|---------------|--------|--------|------------------------|-----|--------|--------------|
| Actual/ Baseline | 2/2008 | 3/2009 | 12/2009 | 9/2010 | 3/2011 | 9/2011 | 3/2012 | 4/2012 | TBD | TBD | TBD |
| Documentation | Website:spaceflightsystems.grc.nasa.gov/Advanced/IS SResearch/Investigations/ACME eRoom:collaboration.grc.nasa.gov/eRoom/NASAc1f1/ GaseousCombustion/0_56f47 | | | | SRD: EDMP: | | | Project Plan: SEMP: | | | |